Claims

1. A method of using optical time-domain reflectometry (OTDR) with a WDM transmission system that includes a plurality of terminals interconnected by at least two pairs of unidirectional optical transmission paths each of which has at least one repeater therein, said method comprising the steps of:

transmitting an optical probe signal from a first OTDR unit associated with a first terminal into the repeater over a first optical path in a first of the at least two pairs of unidirectional optical transmission paths;

receiving by the first OTDR unit a first returned OTDR signal over a second optical path in the first optical path pair, said first OTDR signal containing status information concerning the first optical path in the first optical path pair;

coupling the optical probe signal from the first optical path in the first optical path pair to a second optical path in the second optical path pair, said first optical path in the first optical path pair supporting optical signals traveling in a direction opposite to optical signals supported by the second optical path in the second optical path pair;

receiving over a first optical path in the second optical path pair a second returned OTDR signal in which status information concerning the second optical path in the second optical path pair is embodied, said second returned OTDR signal traversing a repeater located in the second optical path pair; and

coupling the second returned OTDR signal from the first optical path in the second optical path pair to the second optical path in the first optical path pair so that the second OTDR signal is returned to the first OTDR unit, said first optical path in the second optical path pair supporting optical signals traveling in a direction opposite to optical signals supported by the second optical path in the first optical path pair.

2. The method of claim 1 further comprising the steps of:

transmitting a second optical probe signal from a second OTDR unit associated with the first terminal into the repeater over the first optical path in the second optical path pair;

receiving by the second OTDR unit a third returned OTDR signal over the second optical path in the second optical path pair, said third OTDR signal containing status information concerning the first optical path in the second optical path pair;

coupling the second optical probe signal from the first optical path in the second optical path pair to the second optical path in the first optical path pair;

receiving over the first optical path in the first optical path pair a fourth returned OTDR signal in which status information concerning the second optical path in the first optical path pair is embodied; and

coupling the fourth returned OTDR signal from the first optical path in the first optical path pair to the second optical path in the second optical path pair so that the fourth OTDR signal is returned to the second OTDR unit.

3 The method of claim 1 wherein said at least one repeater includes a rare-earth doped optical amplifier through which the optical probe signal is transmitted.

4. The method of claim 3 wherein the step of receiving the first returned OTDR signal is performed at an output of the rare-earth doped optical amplifier.

5. The method of claim 1 wherein the status information includes discontinuities in the optical paths that give rise to optical attenuation.

6. In a bi-directional optical transmission system that includes first and second terminals interconnected by at least first and second unidirectional optical transmission path pairs, each of said first and second path pairs having at least one repeater therein, an OTDR arrangement comprising:

a first OTDR unit associated with the first terminal transmitting a first optical probe signal over a first optical path in the first optical path pair and receiving returned OTDR signals in which status information concerning the first optical path in the first optical path pair and a second optical path in the second optical path pair, said first optical path in the first optical path pair supporting

optical signals traveling in a direction opposite to optical signals supported by the second optical path in the second optical path pair;

a second OTDR unit associated with the first terminal transmitting a second optical probe signal over a first optical path in the second optical path pair and receiving returned OTDR signals in which status information concerning the first optical path in the second optical path pair and a second optical path in the first optical path pair, said first optical path in the second optical path pair supporting optical signals traveling in a direction opposite to optical signals supported by the second optical path in the first optical path pair;

a third optical path optically coupling the first optical path in the first optical path pair to the second optical path in the second optical path pair for communicating therebetween the first optical probe signal and the returned OTDR signals in which status information concerning the first optical path in the second optical path pair; and

a fourth optical path optically coupling the second optical path in the first optical path pair to the first optical path in the second optical path pair for communicating therebetween the second optical probe signal and the returned OTDR signals in which status information concerning the second optical path in the second optical path pair.

7. In the bi-directional optical transmission system of claim 6, an OTDR arrangement wherein said at least one repeater includes a rare-earth doped optical amplifier through which the optical probe signal is transmitted.

8. In the bi-directional optical transmission system of claim 7, an OTDR arrangement further comprising an optical loopback path optically coupling the first optical path to the second optical path in each optical path pair.

9. In the bi-directional optical transmission system of claim 6, an OTDR arrangement wherein the status information includes discontinuities in the optical paths that give rise to optical attenuation.